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Description

Integral Locking Coupler

Cross Reference To Related Applications

[0001] This application claims the benefit of United States Provisional Patent Application No. 60/320,230, filed May 28, 2003, the entire disclosure of which is hereby incorporated by reference.

Background of Invention

[0002] The present invention relates to an improved trailer coupler and more particularly to a trailer coupler to provides easy engagement and disengagement from a receiver and further includes a locking mechanism.

[0003] Typical vehicle hitch mechanism employ a mount, a hitch pin and a lock. When engaging the standard hitch mechanism, all three of the pieces, namely the mount, the hitch pin, and the lock, must be aligned and properly placed. Each must be assembled separately, thus taking substantial time and effort. This can be especially troublesome in inclement weather and on hitches that are located close to

the pavement or shrouded by bumpers. The mount or coupler is placed in the receiver, properly aligned and then secured with a hitch pin. A lock is then applied to the hitch pin to secure the mounting assembly.

[0004] Prior art assemblies have attempted to combine certain of these features, however have not provided a fully-functioning locking coupler. For example, in some references a locking mechanism is not employed, thereby requiring a separate locking component. These references generally include spring-biased bolts that move in and out to engage the coupler. In some references, the bolts must be manually forced inward in order to retract the bolts and allow for insertion into the receiver. In other references, the bolts are moved in and out through engagement of a surface that has different dimension depending on the placement of the surface. For example, a blocker may be used, wherein the blocker has two different dimensions. The first dimension is larger and is positioned for maintaining the bolts in the outward position. The second dimension is smaller and is positioned for allowing the bolts to be in the inward, retracted position. This type of coupler require a large piece that must be moveable within the coupler. In some references, complex

drive gears and gear racks are employed to move the engagement surface. In embodiments such as the use of a blocker or a drive gear and slidable engagement surface, the mechanism is not coupled to a lock cylinder and does not allow for optimum mechanical advantage. As such, there exists a need for an improved coupler that not only allows integration of the mount, hitch pin and lock , but also operates in a manner such as to provide optimal mechanical advantage in movement of the pieces and is cost efficient to produce.

SUMMARY OF INVENTION

[0005] The present invention relates to an integral locking coupler. The integral locking coupler includes a locking mechanism that is coupled to a set of engagement pins. The movement of the locking mechanism translates to the movement of the engagement pins to and from an extended position and a retracted position. When in the retracted position, the coupler can be inserted or removed from a receiver. When in the extended position, the engagement pins penetrate through holes in the receiver and secure the coupler to the receiver. The locking mechanism ensures that the engagement pins are maintained in the extended position and can not be manipulated to

remove the coupler without unlocking the locking mechanism.

Brief Description of Drawings

[0006] The present invention will be more fully understood by reference to the following detailed description of the invention and the accompanying drawings. The drawings represent exemplary embodiments of the present invention and are included for illustrative purposes in order to facilitate understanding of the description. Other embodiments of the present invention contemplated by the description are included within this application to the extent they fall within the scope of the claims attached hereto.

[0007] Figure 1 is a perspective view of a integral locking ball mount of the present invention as applied to a towing hitch bar.

[0008] Figure 2 is a slide plan view of the integral locking ball mount shown in Figure 1.

[0009] Figure 3 is an exploded view of the integral locking ball mount shown in Figure 1.

[0010] Figure 4 is an exploded view of the internal components of the integral locking ball mount shown in Figure 1.

[0011] Figure 5 is a perspective assembly drawing of the internal components shown in Figure 4.

[0012] Figure 6 illustrates an alternative embodiment of the integral locking ball mount of the present invention.

[0013] Figure 7 illustrates an alternative embodiment of the integral locking ball mount of the present invention incorporating a rotating cam and shaft.

[0014] Figure 8 illustrates an another alternative embodiment of the integral locking ball mount of the present invention incorporating a rotating cam and shaft.

[0015] Figure 9 illustrates the locking pin subassembly of the rotating cam and shaft embodiments.

[0016] Figure 10 illustrates the rotating cam of Figure 9.

[0017] Figure 11 illustrates an alternative embodiment of the invention, wherein the integral coupling is employed in combination with a cargo carrier.

DETAILED DESCRIPTION

[0018] The present invention is a integral locking ball mount, or coupler, *10* that performs the functions of a standard ball mount, hitch pin and lock. The coupler *10* include a lock cylinder *15* that is coupled to an actuation mechanism that uses optimal mechanical advantage to move a set of engagement pins *20* to and from an extended engagement position and a retracted disengagement position. This al-

lows for the coupler *10* to easily installed and removed from a trailer receiver with minimal effort, while still maintaining maximum lock security of the coupler.

[0019] The coupler *10* includes a coupler housing *12* with an internal housing cavity *14* and two apertures *16* which align with the engagement pins *20*. When the engagement pins *20* are in the extended position, the engagements pins *20* extend outward through the apertures *16* and beyond the coupler housing *12*. When the engagement pins *20* are in the retracted position, the engagement pins *20* are drawn inward through apertures *16* and are either flush with the coupler housing *12* or are moved entirely or substantially within the housing cavity *14*.

[0020] The integral locking ball mount *10* generally includes a ball mount plate *40*, lock housing *44*, lock cylinder, or other lock mechanism, *15* and locking pin subassembly *45*. The locking pin subassembly *45*, shown in Figure 4, generally includes two engagement pins *20*, two sliding pins *48*, a biasing means, such as a spring, *50* and a housing *52*. The housing *52* as shown include a main portion *53* and two slide plates *54*. The side plates *54* include apertures *55* through which the engagement pins *20* extend. The biasing means *50* applies force on the engagement

pins *20* forcing them outwards into the engagement position.

[0021] The cylinder *15* can be any conventional lock cylinder and is generally disposed within lock cylinder housing *60*. The cylinder *15* engages cam *65* which engages lever *70*. The cam *65* includes a protrusion *67* that engages slot *72* of the lever *70*. In general, any mechanical coupling of the cylinder *15* to the lever *70* can be used provided that the rotation of the cylinder moves the lever in the horizontal plane, as shown in Figure 4. As shown in Figure 4, the slot *72* is located on a tab *73* that extends outward away from the main portion *74* of the lever. As the cylinder *15* is rotated to the unlocked position, generally a 180 degree rotation, the protrusion *67* rotates pulling the tab *73* and the lever *70* away from the engagement pins *20*. This allows the engagement pins *20* to be retracted and the coupler *10* to be inserted or removed from the receiver, as explain in further detail below.

[0022] Lever *70* further includes pin slots *77* which engage sliding pins *48*. Pin slots *77* are generally c-shaped, wherein the bottom of the c-shape *77b* is angled inward toward the center of the lever *70*. As such, when the sliding pins *48* are moved along the pin slots *77* the sliding pins *48* not

only travel axially, but also travel radially inward toward the center of the of coupler *10*. Since the sliding pins *48* are coupled to the engagement pins *20*, the axial movement of the sliding pins *48* cause the engagement pins *20* to extend and retract. This movement of the engagement pins *20* allows the coupler *10* to be inserted and removed from a receiver. Optionally, the lever *70* may include a blocker *78* which extends from the lever *70* to be in between the engagement pins *20* when in the extended position. The blocker *78* provides additional security against attempts to manually retract the engagement pins *20*. The blocker *78* can be any shape or configuration provided it provides additional security to prevent the movement of the engagement pins to the retracted position when the coupler is in the locked position.

[0023] To install the coupler *10* shown in Figures 1-5, a key (not shown) is inserted into the lock cylinder *15* and rotated 180 degrees to unlock the cylinder. The rotation of the cylinder *15* slides the lever *70* axially through engagement with cam *65*. The axial movement of the lever *70* moves the sliding pins *48* along pin slots *77* and moves the blocker *78* away from the engagement pins *20*. The engagement pins *20* are thus retracted into the coupler

housing cavity *14* and thus do not extend beyond the coupler housing *12*. So positioned, the coupler *10* can be inserted into a receiver *80* in conventional fashion. The engagement pins *20* are aligned with apertures *82* in the receiver and then the cylinder *15* is rotated back to the locked position. In doing so, the lever *70* slides back to the engagement position, wherein the slide pins *48* move to the radially outward portion of the pin slots *77*. The movement of the sliding pins *48* move the engagement pins *20* to the extended position, thereby penetrating through the coupler housing *12* and through the holes *82* in the receiver *80*. If a blocker *78* is used, the blocker will be positioned between the engagement pins *20* when in the extended position to further prevent inward movement of the engagement pins. The spring *50* biases the engagement pins *20* outward towards the extended position. It should be appreciated that the spring or biasing means *50* is not required to move the engagement pins *20* to or from the engagement position, but the inclusion of such biasing means provides additional security in maintaining the engagement pins in the extended position.

[0024] To remove the coupler shown in Figures 1-5, the key is inserted into the lock cylinder *15* and rotated 180 degrees

to the unlocked position. The rotation of the lock cylinder *15* moves the lever *70* and draws the engagement pins inward into the coupler cavity *14* and out of engagement with the receiver apertures *82*. The coupler *10* can then be removed from the receiver *80*.

[0025] Figure 6 illustrates a different lever mechanism. The cylinder *15* in Figure 6 engages blocker *90* and moves it up and down, as shown in Figure 6, to engage and disengage the lever *70*. Once disengaged, the lever *70* can be pulled axially outward by manipulation of lever portion *92*. The movement of the lever *70* then moves the engagement pins inward or outward as described above.

[0026] Figures 7 and 8 illustrate another embodiment of the integral ball mount of the present invention. Figures 7 and 8 differ merely in the location of the lock cylinder *15*. The lever of the prior embodiment is replaced with a shaft *100* coupling the lock cylinder *15* to the engagement pins*20*. Rotation of the lock cylinder *15* allows for rotation of the shaft *100*, which in turn rotates cam *105*, as best shown in Figure 10. The cam *105* includes two sliding pins recesses *108* which start towards the outer periphery *109* of the cam *105* and gradually tapers inward toward the center of the cam *105*. The sliding pins *48* are coupled to the engage-

ment pins *20* such that when cam *105* is rotated, the sliding pins *48* move circumferentially and radially inward toward the center the cam *105*, thereby drawing the engagement pins *20* into the coupler cavity *12*. So positioned, the coupler can be inserted or removed from a receiver. Rotation of the shaft *100* in the other direction, will rotate the cam *105* back and move the engagement pins *20* to the extended position. Although not shown in the illustrative examples, one skilled in the art should appreciate that the cylinder and shaft can be mechanically coupled such that rotation of the cylinder would not only unlock the cylinder, but also translate the rotation to the shaft.

[0027] Figure 11 illustrates an alternative embodiment of the invention. Figure 11 illustrates the coupling mechanism applied to a cargo carrier *110*. One skilled in the art should appreciate that the coupling mechanism described herein can be applied not only to a ball mount, but also to cargo carriers, bike carriers, and the like. Such embodiments are meant to be included within the scope of this application.

[0028] It should be appreciated that the locking mechanism *15* can be a variety of mechanisms that provide the end user with a means for locking the integral locking ball mount. For example, the locking mechanism can be an inter-

changable wafer lock cylinder, non-interchangable wafer lock cylinder, pin tumbler cylinder, a push-button lock cylinder, or a tubular lock cylinder. In one embodiment the locking mechanism *15* is located along a side wall portion *120* of the coupler housing *12*. In another embodiments, the locking mechanism *15* is located at the end of the coupler housing *12* or apart of the shaft of lever coupling the lock mechanism to the engagement pins.

[0029] The detailed description has been provided for clearness of understanding of the present invention and is not intended to unnecessarily limit the scope of the invention. Modifications will be obvious to those of ordinary skill in the art, and such modifications are intended to be included as part of this invention to the extent they fall within the scope of the claims attached hereto.